

Claims

- [c1] A roller conveyor comprising:
a pair of opposite sidewalls;
a plurality of idler rollers mounted to said sidewalls; and
a transverse drive system having at least one transverse drive unit comprising:
a self-driven roller positioned along one of said sidewalls and generally transverse to said idler rollers, said self-driven roller comprising an internal motor operable to rotate a roller portion of said self-driven roller relative to an axle portion of said self-driven roller; and
a plurality of drive members, said drive members being engaged with said roller portion of said self-driven roller, each of said drive members drivably connecting said self-driven roller and a respective one of said idler rollers, wherein actuation of said self-driven roller drives said idler rollers via the respective drive members.
- [c2] The roller conveyor of claim 1, wherein said self-driven roller is positioned generally beneath said idler rollers.
- [c3] The roller conveyor of claim 1, wherein said idler rollers are positioned generally orthogonal to said sidewalls.

- [c4] The roller conveyor of claim 2, wherein said self-driven roller is positioned generally orthogonal to said idler rollers.
- [c5] The roller conveyor of claim 1, wherein said idler rollers are skewed with respect to said sidewalls to convey articles partially toward one of said sidewalls.
- [c6] The roller conveyor of claim 5, wherein said self-driven roller is positioned generally parallel to said sidewalls.
- [c7] The roller conveyor of claim 1, wherein said plurality of drive members comprises at least three drive members and wherein said plurality of idler rollers comprises at least three idler rollers.
- [c8] The roller conveyor of claim 1, wherein said roller conveyor includes a plurality of zones, each of said zones including a transverse drive unit operable to independently and rotatably drive a plurality of said idler rollers of said zone.
- [c9] The roller conveyor of claim 8 including at least one article sensor operable to detect articles on said roller conveyor.
- [c10] The roller conveyor of claim 9, wherein said at least one transverse drive unit is selectively activatable in response

to said at least one article sensor to accumulate articles on said idler rollers.

[c11] The roller conveyor of claim 1, wherein said at least one transverse drive unit is selectively activatable to selectively rotatably drive said idler rollers.

[c12] The roller conveyor of claim 1, wherein said at least one transverse drive unit is selectively activatable to rotatably drive said idler rollers in either direction.

[c13] The roller conveyor of claim 1 including a right angle transfer unit having a plurality of belts that are selectively raisable between at least some of said idler rollers and drivable to convey articles in a direction generally normal to the direction of conveyance of said idler rollers.

[c14] The roller conveyor of claim 13, wherein said belts are mounted to a movable portion that is vertically movable between a lowered position, where a conveying surface of said belts is positioned below a conveying surface of said idler rollers, and a raised position, where said conveying surface of said belts is positioned above said conveying surface of said idler rollers.

[c15] The roller conveyor of claim 14, wherein said movable portion is vertically movable via a rotational drive mem-

ber, whereby rotation of said drive member causes translational movement of a camming member, which causes vertical movement of said movable portion relative to a mounting base of said right angle transfer unit.

[c16] The roller conveyor of claim 15, wherein said rotational drive member is rotated via a rotational drive motor.

[c17] The roller conveyor of claim 15, wherein said camming member comprises a roller that rolls along a generally horizontal slot at said mounting base and an angled slot at said movable portion in response to rotation of said drive member.

[c18] The roller conveyor of claim 13, wherein said belts are drivable via a second self-driven roller having an internal motor operable to rotatably drive a roller portion relative to an axle portion of said second self-driven motor.

[c19] A roller conveyor comprising:
a pair of opposite sidewalls;
at least two tandem zones, each of said at least two tandem zones including a plurality of idler rollers mounted to said sidewalls; and
a transverse drive system comprising a transverse drive unit at each of said at least two tandem zones, wherein each of said transverse drive units comprises a motor-

ized roller positioned generally transverse to said plurality of idler rollers and a plurality of drive members connected between said motorized roller and at least some of said plurality of idler rollers, each said motorized roller having an internal motor that is operable to rotate a roller portion of said motorized roller relative to an axle portion of said motorized roller, said motorized rollers being operable to drive said drive members to rotatably drive said at least some of said plurality of rollers of the respective ones of said at least two tandem zones.

[c20] The roller conveyor of claim 19, wherein each of said at least two tandem zones includes an article sensor operable to detect an article on said idler rollers of said zone.

[c21] The roller conveyor of claim 20, wherein said transverse drive system is operable to accumulate articles on said rollers of said tandem zones.

[c22] The roller conveyor of claim 19, wherein said motorized roller comprises an internal motor operable to rotatably drive a roller portion of said motorized roller relative to an axle portion of said motorized roller.

[c23] The roller conveyor of claim 19, wherein said motorized roller is positioned generally beneath said idler rollers.

[c24] The roller conveyor of claim 19, wherein said idler rollers

are positioned generally orthogonal to said sidewalls.

[c25] The roller conveyor of claim 24, wherein said motorized roller is positioned generally orthogonal to said idler rollers.

[c26] The roller conveyor of claim 19, wherein said idler rollers are skewed with respect to said sidewalls to convey articles partially toward one of said sidewalls.

[c27] The roller conveyor of claim 26, wherein said motorized roller is positioned generally parallel to said sidewalls.

[c28] The roller conveyor of claim 19, wherein said plurality of drive members comprises at least three drive members.

[c29] The roller conveyor of claim 19 including a right angle transfer unit having a plurality of belts that are selectively raisable and drivable to convey articles in a direction generally normal to the direction of conveyance of said idler rollers.

[c30] The roller conveyor of claim 29, wherein said belts are mounted to a movable portion that is vertically movable between a lowered position, where a conveying surface of said belts is positioned below a conveying surface of said idler rollers, and a raised position, where said conveying surface of said belts is positioned above said

conveying surface of said idler rollers.

- [c31] The roller conveyor of claim 30, wherein said movable portion is vertically movable via a rotational drive member, whereby rotation of said drive member causes translational movement of a camming member, which causes vertical movement of said movable portion relative to a mounting base of said right angle transfer unit.
- [c32] The roller conveyor of claim 31, wherein said rotational drive member is rotated via a rotational drive motor.
- [c33] The roller conveyor of claim 31, wherein said camming member comprises a roller that rolls along a generally horizontal slot at said mounting base and an angled slot at said movable portion in response to rotation of said drive member.
- [c34] The roller conveyor of claim 29, wherein said belts are drivable via a second self-driven roller having an internal motor operable to rotatably drive a roller portion relative to an axle portion of said second self-driven motor.
- [c35] A transverse drive system operable to rotatably drive a plurality of idler rollers of a conveyor, the idler rollers being mounted to opposite sidewalls of the conveyor, said transverse drive system comprising:
at least one transverse drive unit having a motorized

roller and a plurality of drive members positionable around said motorized roller, said motorized roller being positionable generally transverse to the idler rollers of the conveyor, said motorized roller having an internal motor that is operable to rotate a roller portion of said motorized roller relative to an axle portion of said motorized roller, each of said plurality of drive members being positionable around and in engagement with said roller portion of said motorized roller and a respective one of the idler rollers, wherein said motorized roller is operable to independently rotatably drive the idler rollers via respective ones of said drive members.

- [c36] The transverse drive system of claim 35, wherein said transverse drive system comprises at least two transverse drive units, each of said at least two transverse drive units being operable to rotatably drive at least two zones of idler rollers.
- [c37] The transverse drive system of claim 36 including an article sensor positioned at each of the zones of the conveyor and operable to detect an article on the idler rollers of the zone.
- [c38] The transverse drive system of claim 37, wherein said transverse drive system is operable to accumulate articles on the idler rollers of the zones in response to said

article sensors.

- [c39] The transverse drive system of claim 35, wherein said motorized roller is positionable generally beneath said idler rollers.
- [c40] The transverse drive system of claim 35, wherein said motorized roller is positionable generally orthogonal to said idler rollers.
- [c41] The transverse drive system of claim 35, wherein said motorized roller is positionable generally parallel to the sidewalls of the conveyor.
- [c42] The transverse drive system of claim 35, wherein said plurality of drive members of said transverse drive unit comprises at least three drive members.
- [c43] The transverse drive system of claim 35 including a right angle transfer unit that is operable to raise articles from a conveying surface of said idler rollers and to transfer the articles in a direction that is generally normal to the direction of conveyance of said idler rollers.
- [c44] A roller conveyor comprising:
 - opposite sidewalls;
 - a plurality of idler rollers mounted to said opposite sidewalls; and

a drive unit operable to independently rotatably drive at least three of said idler rollers, said drive unit comprising:

a motorized roller having an internal motor operable to rotate a roller portion of said motorized roller relative to a shaft portion of said motorized roller; and

at least three drive members, each of said at least three drive members being positioned around and in engagement with said roller portion of said motorized roller and a respective one of said at least three idler rollers, wherein rotation of said roller portion of said motorized roller independently rotatably drives each of said at least three idler rollers via the respective ones of said at least three drive members.

[c45] The roller conveyor of claim 44, wherein said roller conveyor comprises at least two drive units, each of said at least two drive units being operable to independently rotatably drive at least three idler rollers of a respective one of at least two zones of said roller conveyor.

[c46] The roller conveyor of claim 45 including an article sensor positioned at each of the zones of the conveyor and operable to detect an article on said idler rollers of said zone.

[c47] The roller conveyor of claim 46, wherein said drive units

are operable to accumulate articles on said idler rollers of said zones in response to said article sensors.

[c48] The roller conveyor of claim 44, wherein said motorized roller is positioned generally beneath said idler rollers.

[c49] The roller conveyor of claim 44, wherein said motorized roller is positioned generally transverse to said idler rollers.

[c50] The roller conveyor of claim 44, wherein said motorized roller is positioned generally parallel to said sidewalls.

[c51] A right angle transfer unit positioned at a conveying section, said conveying section comprising:
opposite sidewalls and a plurality of rollers mounted to and between said sidewalls and defining a roller conveying surface for conveying articles in a first direction of conveyance;
a base portion generally fixedly positioned relative to said sidewalls;
a movable portion that is movable generally vertically relative to said base portion;
a plurality of belts, each of which is reeved around a plurality of wheels, said belts and said wheels being mounted to said movable portion and being movably positioned between respective adjacent rollers, said belts

defining a belt conveying surface for conveying articles in a second direction of conveyance that is different from said first direction of conveyance; and
a rotational drive motor operable to rotate a rotatable drive member to cause vertical movement of said movable portion relative to said base portion to raise said belts relative to said rollers such that said belt conveying surface is positioned above said roller conveying surface, said belts being driven to convey articles in said second direction of conveyance when said belts are raised.

[c52] The right angle transfer unit of claim 51, wherein said rollers are rotatably driven via a motorized roller having an internal motor operable to rotate a roller portion of said motorized roller relative to an axle portion of said motorized roller.

[c53] The right angle transfer unit of claim 52, wherein said motorized roller is mounted along one of said sidewalls and is drivably connected to at least some of said idler rollers via respective drive bands.

[c54] The right angle transfer unit of claim 53, wherein said belts are drivable via a second motorized roller having an internal motor operable to rotatably drive a roller portion relative to an axle portion of said second motorized motor.

- [c55] The right angle transfer unit of claim 54, wherein said motorized roller and said second motorized rollers are arranged generally parallel to one another.
- [c56] The right angle transfer unit of claim 51, wherein rotation of said rotatable drive member causes a translational movement of a lifting member which in turn causes generally vertical movement of said movable portion relative to said base portion.
- [c57] The right angle transfer unit of claim 56, wherein said lifting member moves along a camming surface of said mounting base and a camming surface of said movable portion, said camming surfaces being angled relative to one another such that movement along said camming surfaces causes generally vertical movement of said movable portion relative to said mounting base.
- [c58] The right angle transfer unit of claim 51, wherein said belts are driven via at least one motorized roller having an internal motor operable to rotate a roller portion of said motorized roller relative to an axle portion of said motorized roller.
- [c59] The right angle transfer unit of claim 58, wherein said axle portion of said motorized roller is mounted to said movable portion.

- [c60] The right angle transfer unit of claim 51, wherein said rotational drive motor is operable to selectively generally vertically move said movable portion between a lowered position, where said belt conveying surface is below said roller conveying surface, and a raised position, where said belt conveying surface is above said roller conveying surface.
- [c61] The right angle transfer unit of claim 60 including at least one biasing member that urges said movable portion toward said raised position.
- [c62] The right angle transfer unit of claim 51, wherein said second direction of conveyance is generally normal to said first direction of conveyance.